General anatomy and physiology

- Objective - Define anatomical terms with regard to function.
- Pseudocoelom - body cavity, fluid-filled under pressure so that worm can move when muscles contract. Movement is essential for nematode survival.
- Dorsal and ventral cords - major nerves. Target of many anthelmintic (deworming) drugs.
- Lateral cords - excretory system.
General anatomy and physiology

- Longitudinal section
- Cross section
- Movement inside host
- Movement outside host
General anatomy and physiology

- Digestive system: Buccal cavity with or without teeth.
- Well developed or vestigial.
General anatomy and physiology

• Esophagus: various forms identify larval stages and characterize families of nematodes.
  a. rhabditiform
  b. strongyliform
  c. filariform
  d. stichosome
General anatomy and physiology

• 3. intestine is a straight tube, no bends.

• 4. anus near posterior end.
General anatomy and physiology

- All nematodes in this course only reproduce sexually, except *Strongyloides*.
- Adult stage nematodes are male or female, not hermaphroditic like flat worms.
General anatomy and physiology

- Males, smaller than females, have copulatory bursa for grasping female and copulatory spicules for guiding sperm. Long, tubular, winding reproductive tract.
General anatomy and physiology

- Females have a long tubular reproductive tract opening to outside at a vulva that may be anterior, posterior or mid body.
Order Rhabditida: focus on the genus *Strongyloides*

- Exclusive to this nematode order: sexually reproducing free-living stage and parthenogenetic adult parasitic stage.
Order Rhabditida: focus on the genus *Strongyloides*

- Rhabditic mange – larval stages of free-living *Rhabditis strongyloides* penetrates skin
- Also associated with *Strongyloides* sp. Skin penetration.
Order Rhabditida: focus on the genus *Strongyloides*

- Free living adults have rhabditiform esophagus
- Parasitic adults small, only adult females found in small intestine of host, long filariform esophagus
Order Rhabditida: focus on the genus *Strongyloides*

Females produce egg with L₁: hatches quickly (see L₁ in fresh feces of human and dog, larvated egg in other host species), Diagnostic importance? Pathogenic importance?
Order Rhabditida: focus on the genus *Strongyloides*

- Homogonic cycle - $L_1$ to infective (skin penetrating) $L_3$ within 24 hours. Autoinfection by skin penetration can lead to hyperinfection.
Order Rhabditida: focus on the genus *Strongyloides*

- Heterogonic cycle - $L_1$ to free-living adult females and males that produce more new $L_1$. Increases number of infective $L_3$ in environment (soil/bedding).
Order Rhabditida: focus on the genus *Strongyloides*

• Lactogenic route of infection.

Infective larva in milk
Order Rhabditida: focus on the genus *Strongyloides*

- Skin penetrating route of infection.
Pathological lesions – Strongyloides

- Enteritis response to adult females
- Parasic adult females
- Lung reaction to migrating larvae
Pathological lesions – *Strongyloides*

- Larval migration to lungs and on to intestine via trachae in neonatal and young animals. *In adult animals larval migration to mammary tissue and arrest until onset of lactation in females.*
- Immunosuppressed adult host susceptible to hyperinfection and clinical signs.
- Otherwise the occurrence of clinical signs limited to neonatal and young animals.
Diagnosis and control: *Strongyloides*

- Diagnosis: eggs containing larva in fresh feces of most host species. Exception: in dog, cat and man $L_1$ are in fresh feces.
- Mother infects newborn with milk containing $L_3$. Mother will be fecal test negative. Babies will be shedding eggs or $L_1$. How does mother get infected?
- Treat the babies to control the transmission. Until fecal negative.
Baermann technique

- **Step 1**: Place a 10-g or larger fecal sample in the center of a double layer of cheesecloth or gauze.
- **Step 2**: Wrap the edges around the fecal sample to make a pouch and secure it with the rubber band.
- **Step 3**: Pass a pencil or applicator sticks through the elastic band and suspend the pouch containing the fecal sample over the bowl of the hollow stem wine glass.
- **Step 4**: Fill the wine glass completely with tepid tap water. Be sure not to let the corners of the fecal packet hang over the sides of the wine glass because they act as a wick for water.
- **Step 5**: Allow the glass to sit for at least eight hours and preferably overnight.
- **Step 6**: Remove the feces and discard.
- **Step 7**: Using a transfer pipette or 1-ml syringe with a needle attached, aspirate a small amount water from the very bottom of the hollow stem of the glass.
- **Step 8**: Place a few drops on a slide, add a cover slip, and examine the slide under a microscope.

Anne M. Zajac, DVM, PhD, DACVM (parasitology),
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Treatment (FYI not on test): *Strongyloides*

- Fenbendazole, 50mg/kg 5 days. For dogs. May add moxidectin as monthly treatment.
- Macrolid anthelmintics (ivermectin, and other avermectins). For humans and pigs.
- Febantel for horses used at 50 mg/kg.
- Oxibendazole for horses at 15 mg/kg.
- The above dosage/drug information is FYI, not for testing.